ANNUAL REPORT 1964

KITCHENER

water pollution control plant

DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Kitchener Local Advisory Committee,
City of Kitchener .

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Kitchener Water Pollution Control Plant, OWRC Project No. 58-S-19.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Kitchener Water Pollution Control Plant, OWRC Project No. 58-S-19 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

CONTENTS

KITCHENER
water pollution control plant

operated for

THE CITY OF KITCHENER

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

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W. S. MacDonell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: **C. W. Perry**
Regional Supervisor: **D. A. McTavish**
Operations Engineer: **B. G. Porter**

801 Bay Street **Toronto 5**

'64 REVIEW

This report presents in detail significant data on the operation of various treatment units at the Kitchener Water Pollution Control Plant.

The average daily flow of 8.3 million gallons was greater than the average daily flow of 7.8 million gallons in 1963 by 6.4 percent. In addition there was an increase in the average BOD and suspended solids in the raw sewage as compared to the average figures in 1963. The average raw sewage BOD of 451 ppm was greater than the average raw sewage BOD in 1963 of 307 ppm by 46.9 percent and the average suspended solids of 394 ppm was greater than the average suspended solids in 1963 of 324 ppm by 21.6 percent. Although the average BOD in the final effluent of 20 ppm exceeded the OWRC objective of a BOD concentration not greater than 15 ppm, the average percent BOD removal was 95.6 percent.

With the advent of the aeration section during the latter part of 1963, the volume of sludge to be handled was greatly increased. As a result, vacuum filter operation was extended to continuous operation. However, near the end of January it became evident that continuous filter operation was resulting in extensive maintenance problems. Therefore, the filter operation was reduced to two shifts. A tank truck was rented to haul excess liquid sludge.

Scum layers that existed in both secondary digesters prevented the formation of a good supernatant. In order to remove this scum layer, both digesters were drained between May 1 and July 17. During the draining process, sludge was pumped and drained by gravity to the plant grounds. After the draining process was completed the secondary digesters were placed in series or tertiary operation. The procedure of renting trucks for sludge disposal was abandoned and sludge was hauled from the plant grounds during the remainder of the year on a contract basis.

A total of 3,026.52 million gallons of sewage were treated during the year at a total cost of $217,425. The operating cost per million gallons and the cost per pound of BOD removed were $71.84 and $0.017 respectively.

Under supervision by head office engineers, the plant staff has operated a clean, attractive and efficient plant for the City of Kitchener.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1956 - 1964

INCEPTION

In 1956, the City of Kitchener and the Ontario Water Resources Commission initiated plans to enlarge the existing Doon Valley Sewage Treatment Plant and replace the existing Spring Valley plant with a pumping station to discharge sewage from that area to the Doon plant. The enlargement of the Doon plant and the addition of secondary sections to provide full biological treatment was undertaken in two stages.

The firm of Proctor & Redfern, Toronto, Ontario, Consulting Engineers, was engaged to prepare plans and specifications for the project.

APPROVAL

The initial agreement between the City and the Commission to finance, construct and operate the plant was signed late in 1956.

CONSTRUCTION

Construction of the Doon plant extensions, Spring Valley pumping station and force main and relief sewer was carried out by Schwenger Construction Co. Ltd., Harry Wunder Construction Ltd. and Ture Anderson Construction Ltd., respectively. The primary enlargement was completed in 1960.

Secondary treatment facilities were completed in 1963 by Dunker Construction Co. Ltd., Kitchener.

TOTAL COST

Doon Primary plant enlargements	$ 1,308,000
Secondary treatment facilities	1,515,000

Project Staff

A. W. Becker

Superintendent

Assistant Superintendent - L. R. Edwards

Lead Operators

J. H. Bowie
F. Dobson
P. W. Kuehl
G. L. Lebegut
A. H. Schlueter

Laboratory Technician

K. Sakamoto

Groundskeepers

D. M. MacGregor
D. J. Oland

Maintenance Staff

Foreman - W. W. Reinhart
Electrician - L. B. Brown
Mechanic - Z. V. Etmanski

Operators

J. J. Halley
A. Nielsen
J. P. O'Reilly
W. G. Pohl
E. R. Wheeler

COMMENTS

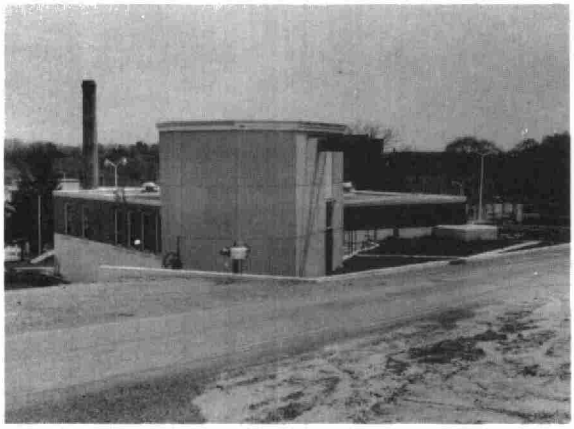
The plant is staffed 24 hours per day, seven days per week. Each man works a 40 hour week and the total staff complement is 18 men.

Mr. A. W. Becker, Plant Superintendent for many years retired on December 31, 1964 after a lengthy illness. He commenced employment at the plant in April, 1940 and had contributed greatly to the successful operation of the project.

Mr. D. M. MacGregor resigned during the year and had not been replaced by December 31, 1964.

Mr. K. Sakamoto, Laboratory Technician, received his Certificate of Qualification as a Sewage Works Operator in 1964 after successfully completing a series of three one week duration courses of instruction in Toronto sponsored by the OWRC.

Description of Project

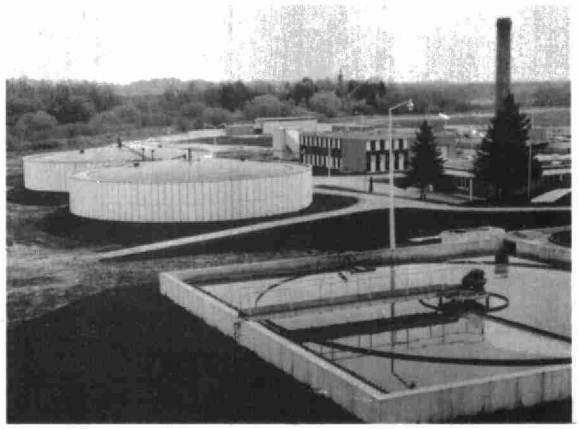


INFLUENT WORKS

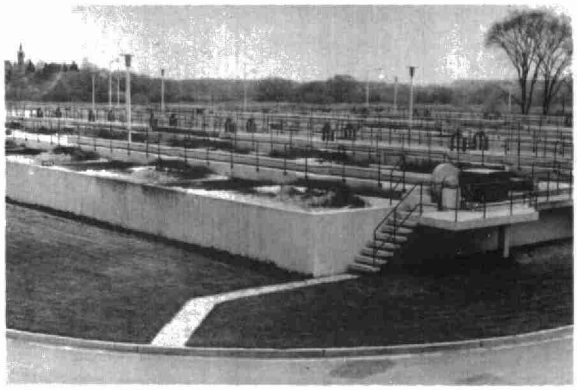
The sewage reaches the plant through a 48 inch diameter trunk main and passes through a coarse bar screen which removes large (over two inches) solids. The flow then passes through two rotogrators and one comminutor which are mechanically cleaned medium bar screens equipped with a shredding drum to cut the screenings and allow them to join the main flow. The sewage then passes through a 3 foot Parshall flume where the flow is measured, indicated and recorded. The flow is then divided between two aerated grit chambers. Sand and grit are removed and air lifted to a hopper to be disposed by burial. The air degrittors have a total volume of 23,000 gallons and provide a retention time of three minutes at design flow. Two mesh rotary screens receive sewage from the grit removal units. These screens are designed to remove hair and other matted material.

PRIMARY CLARIFIERS

A grease separator is located on each side of the grit building and sewage passes through these units where large quantities of bubbled air cause the grease to rise in the form of grease balls. The grease balls are removed manually prior to primary clarification.



Four concrete tanks, 60 ft. x 60 ft. x 11.75 ft. SWD provide primary clarification. Each clarifier is provided with circular extensible sludge collector mechanisms which move the settled sludge to hoppers at the bottom of the clarifiers from where it is withdrawn and discharged to the primary digestion tanks. Circular extensible scum removal mechanisms skim floating material from the top of each clarifier. This material joins the sludge in the digesters.



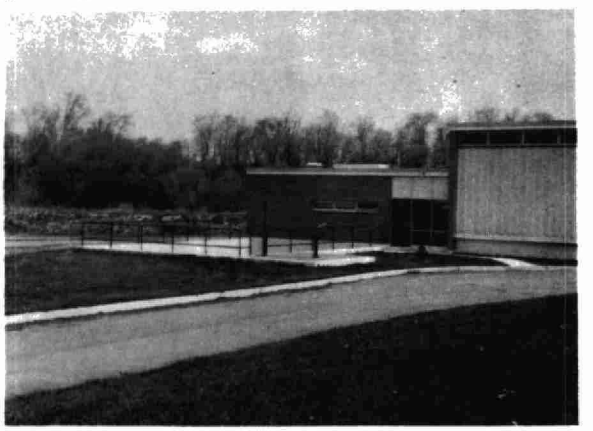
AERATION

Primary clarifier effluent flows through a 48 inch Parshall flume and overflow chamber to four baffled aeration tanks each equipped with fourteen Ames Crosta "Simplex" high intensity mechanical aeration devices. The tanks, continually seeded with activated sludge settled in the final tanks, provide the environment

where, through biological action, the finely divided, suspended and colloidal materials are oxidized.

FINAL CLARIFIERS

Four 80 ft. diameter circular concrete final tanks with 10 ft. liquid depth received the aeration effluent and allow settling of the activated sludge. The clarifiers are the rapid sludge removal type wherein the return sludge is removed hydraulically to a centre launder via plastic uptake pipes mounted on the scraper arms. The waste sludge is scraped to a central sump in the conventional manner from where it is pumped to the incoming raw sewage flow prior to primary clarification. The settled effluent is discharged over weirs to the chlorine contact chamber and subsequently to the Grand River.



SLUDGE DIGESTION TANKS

Two underground primary digesters 65 ft. in diameter x 22 ft. SWD and having a total volume of 900,000 gallons received combined raw and waste activated sludge from the primary clarifiers. These tanks have fixed concrete roofs supported by a structural steel bridge. Sludge to the digesters is measured by a magnetic flow meter. Each digester is equipped with a draft tube mixer and is heated with Rayscott hot water boilers and spiral heat exchangers. The temperature in the digesters is controlled by the amount of sludge recirculation through the heat exchangers. The initial stages of anaerobic digestion occurs in these primary digesters.

Two secondary digesters 100 ft. in diameter and having a 29 ft. mean liquid level, were constructed in 1959. The total secondary digestion volume is 2 1/2 million gallons. Floating covers and gas collection equipment are provided with these tanks. The final stages of anaerobic digestion and settling of the digested sludge occurs in these unheated tanks.

VACUUM FILTER

Digested sludge from the secondary digester is pumped onto a 500 sq. ft. vacuum filter. Lime and ferric chloride are added to the sludge to affect coagulation.

The filter drum is placed under a vacuum and moisture is withdrawn from the sludge. Appurtenances included with the filter are vacuum pumps, filtrate return pumps, lime and ferric chloride pumps, a mixing tank and sludge pumps. Filtrate flows by gravity to a filter sump. From there it is pumped to the influent works just above the air degrittor.

PROJECT COSTS

STAGE I

LONG TERM DEBT: (Total Capital Cost)	$1,312,746.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$ 217,424.52
Debt Retirement	47,626.00
Reserve	11,622.00
Interest Charged	73,855.44
TOTAL	$ 350,527.96

RESERVE ACCOUNT

Balance at January 1, 1964	$ 43,061.04
Deposited by municipality	11,622.00
Interest Earned	2,621.24
	$ 57,304.28
Less Expenditures	411.59
Balance at December 1, 1964	$ 56,892.69

DEBT OUTSTANDING:	$1,058,440.41

STAGE II

LONG TERM DEBT: (Total Capital Cost)	$570,840.00

The total cost to the municiaplity during 1964 was as follows:

Net Operating	$ -
Debt Retirement	17,438.00
Reserve	11,151.00
Interest Charged	26,188.67
TOTAL	$ 54,777.67

RESERVE ACCOUNT

Balance at January 1, 1964	$ 3,717.00
Deposited by municipality	11,151.00
Interest Earned	438.88
	$ 15,306.88
Less Expenditures	-
Balance at December 1, 1964	$ 15,306.88

DEBT OUTSTANDING:	$546,955.00

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	*SUNDRY	WATER
JAN	10778.55	5934.22	314.56		2787.14	1022.07	73.58	156.09	387.24	103.65	
FEB	15247.94	6222.06	506.68		2980.74	4157.72	205.47	123.99	358.12	693.16	
MARCH	12934.30	6023.69	544.30		2799.98	972.02	240.34	81.63	582.38	1689.96	
APRIL	19894.62	6010.18	593.79		2709.78	6534.79	274.08	26.52	476.61	3268.87	
MAY	23040.24	9333.44	842.28		2661.86	3783.24	339.18	184.55	613.88	5199.10	82.71
JUNE	15387.95	6957.23	615.92		2511.32	1181.56	406.35	46.16	1243.64	2425.77	
JULY	15736.03	6192.00	805.77		2396.59	2659.24	136.22	419.24	537.43	2589.54	
AUG	16485.36	6062.80	370.24		2300.07		114.22	254.64	892.10	6491.29	
SEPT	15778.86	6232.41	778.90		2381.65	1030.27	902.53	489.35	2704.61	1074.91	184.23
OCT	,16795.11	7124.91	609.36		2586.96	4599.78	166.29	671.04	439.41	597.36	
NOV	28943.41	6436.25	376.76		2671.91	4908.67	462.33	815.32	6817.81	6454.36	
DEC	26402.15	8935.86	439.64		5254.25	988.97	639.47	535.19	1541.74	7981.62	85.41
TOTAL	217424.52	81465.05	6798.20		34042.25	31838.33	3960.06	3803.72	16594.97	38569.59	352.35

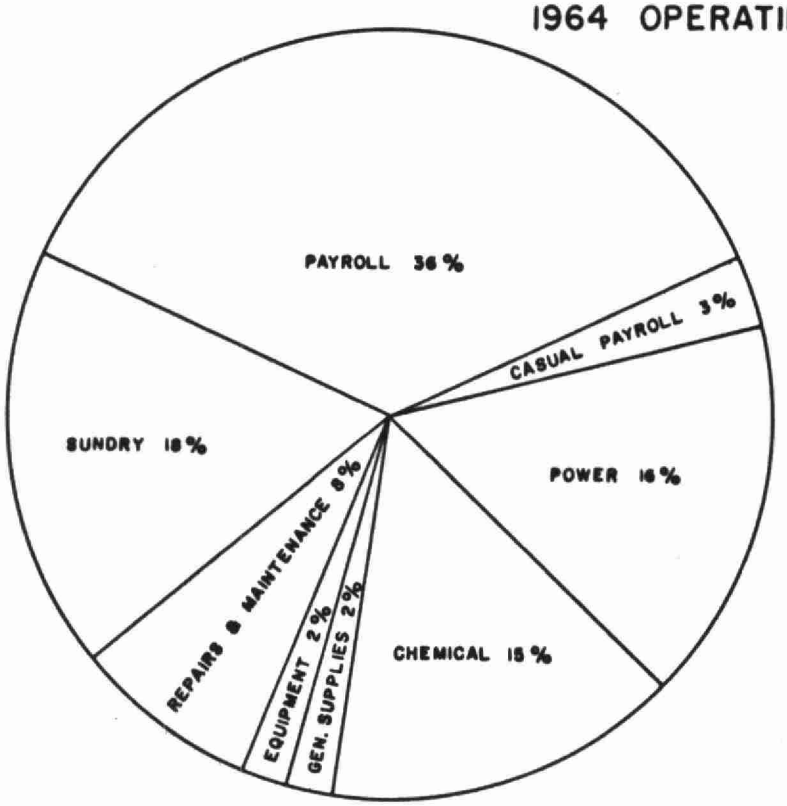
* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $17,317.56
BRACKETS INDICATE CREDIT

YEARLY COSTS

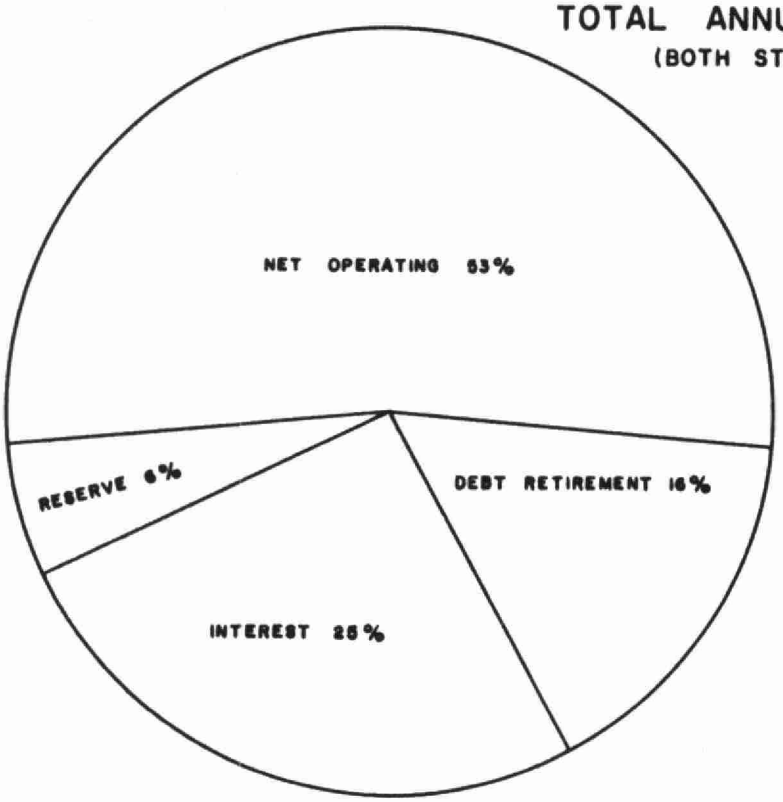
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1961	2649.60	$118,269	* $5.73	$50.30	3.8 CENTS
1962	3254.55	100,007	4.88	30.72	2.4 CENTS
1963	2841.14	137,547	6.82	49.46	2.8 CENTS
1964	3026.52	217,425	10.57	71.84	1.7 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1964 OPERATING COSTS



TOTAL ANNUAL COST
(BOTH STAGES)



VACUUM FILTER COSTS

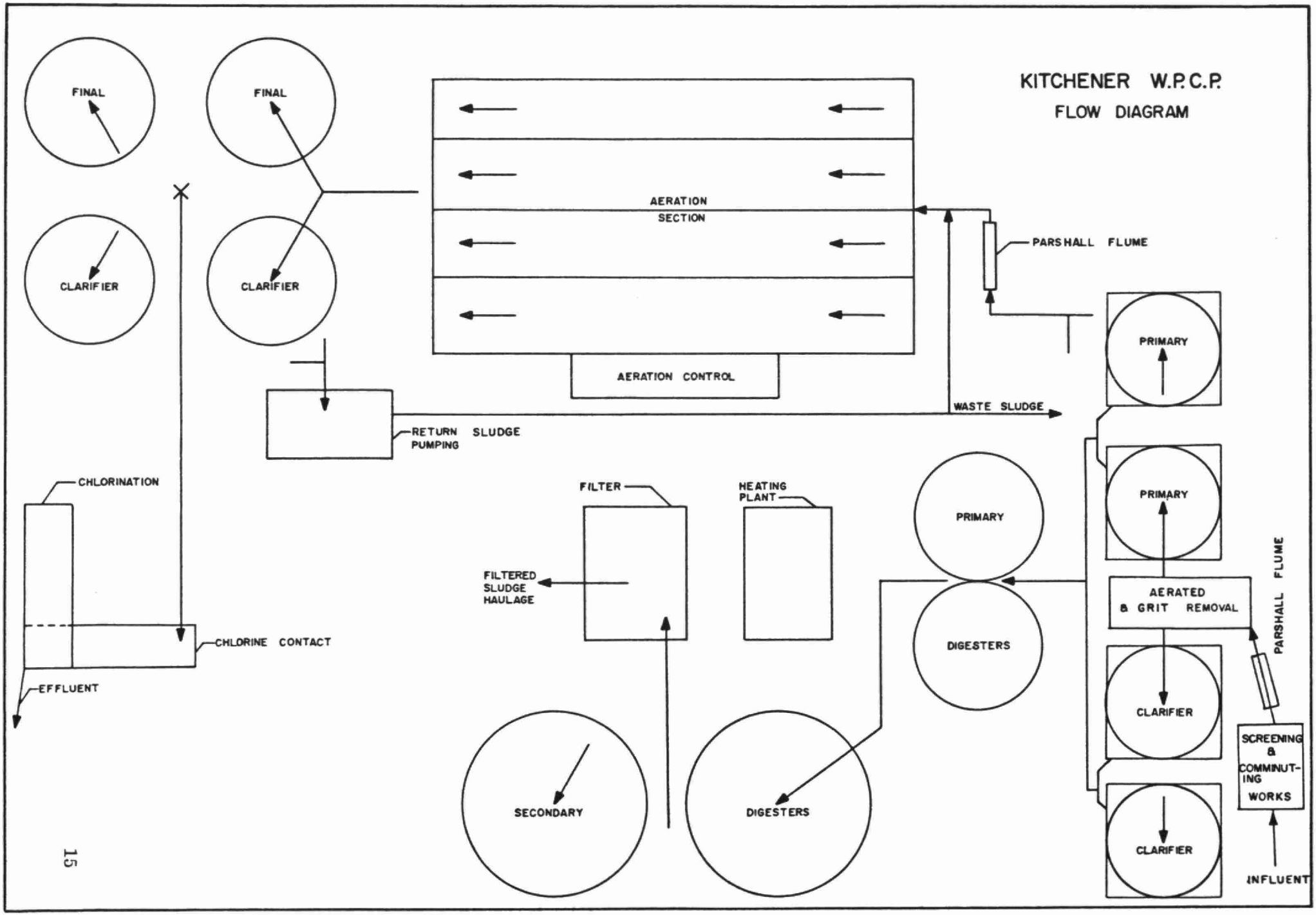
MONTH	COST PER MONTH					TOTAL	COST PER TON DRY WEIGHT					TOTAL
	$FeCl_3$	LIME	LABOUR	ELEC	MAINT		$FeCl_3$	LIME	LABOUR	ELEC	MAINT	
JANUARY	1696	796	642	204	83	3421	8.29	3.89	3.14	1.00	0.41	16.73
FEBRUARY	774	373	642	89	83	1961	8.71	4.20	7.22	1.00	0.93	22.06
MARCH	2064	934	642	232	83	3955	8.88	4.02	2.76	1.00	0.36	17.02
APRIL	1850	1034	642	280	83	3889	6.60	3.69	2.29	1.00	0.30	13.88
MAY	*											
JUNE	*											
JULY	*											
AUGUST	429	273	642	83	83	1510	5.19	3.31	7.77	1.00	1.00	18.28
SEPTEMBER	1374	819	642	203	83	3121	6.78	4.04	3.17	1.00	0.41	15.40
OCTOBER	2382	1069	642	244	83	4420	9.75	4.38	2.63	1.00	0.34	18.10
NOVEMBER	2033	934	642	218	83	3910	9.31	4.28	2.94	1.00	0.38	17.90
DECEMBER	1540	822	642	180	83	3267	8.54	4.56	3.56	1.00	0.46	18.12
TOTAL	14,142	7054	5778	1733	747	29454						
AVERAGE PER MONTH	+ 1571	784	642	193	83	3272	8.16	4.07	3.33	1.00	0.43	16.99

* FILTERS NOT IN SERVICE
\+ AVERAGE OF 9 MONTHS

COMMENTS

Vacuum filtration operation during 1964 cost $29,454 or $16.99 per ton of dry solids filtered.

Technical Section


KITCHENER W.P.C.P.
FLOW DIAGRAM
FINAL
FINAL
CLARIFIER
CLARIFIER
AERATION
SECTION
AERATION CONTROL
PARSHALL FLUME
PRIMARY
PRIMARY
PRIMARY
WASTE SLUDGE
RETURN SLUDGE
PUMPING
CHLORINATION
CHLORINE CONTACT
EFFLUENT
FILTER
HEATING
PLANT
FILTERED
SLUDGE
HAULAGE
DIGESTERS
AERATED
& GRIT REMOVAL
PARSHALL FLUME
CLARIFIER
SCREENING
&
COMMINUT-
ING
WORKS
SECONDARY
DIGESTERS
CLARIFIER
INFLUENT

Design–Data

GENERAL

Type of Plant - Activated sludge.

Design Population - 100,000 persons.

Design Plant Flow - 11.0 MGD (prim.)
13.5 MGD (sec.)

Five Day BOD -

Raw Sewage	-	300 PPM
Removal	-	95%

Suspended Solids -

Raw Sewage	-	450 PPM
Removal	-	95%

PRIMARY TREATMENT

Screening and Comminution

Coarse bar screens.

Two Infilco rotogrators.

One Worthington comminutor.

Grit Removal

Type - Two air degrittors.

Size - 16 ft. x 10 ft. x 12 ft. SWD.

Volume - 23,000 gallons.

Fine Screening

Type - Two Dorr-Oliver-Long rotary screens.

Primary Sedimentation

Type - Four square concrete tanks.

Size - 60 ft. x 60 ft. x 11.75 SWD.

Retention time - 2.2 hours.

Sludge Removal - Mechanical.

SECONDARY TREATMENT

Aeration

Ames Crosta mechanical aerators - 56.

Size - Four tanks, 30 ft. x 30 ft. x 13 ft. 3 in. with "around the end" baffles, each tank being two cells in width and seven cells in length.

Retention - 7 hours at 13.5 MGD.

Final Sedimentation Tanks

Type - Circular concrete (four).

Size - 80 ft. diameter and 10 ft. SWD.

Retention - 2.4 hours at 13.5 MGD.

Chlorine Contact Chamber

Retention - 15 minutes at 13.5 MGD.

Equipment - Two B.I.F. gas chlorinators and one evaporator.

Digestion System

Two Primary Digesters Underground -

Size - 65 ft. diameter x 22 ft. SWD.

Volume - 900,000 gallons.

Fixed covers, mechanical mixing.

Two Secondary Digesters -

Size - 100 ft. diameter x 29 ft. SWD.

Volume - 2.5 million gallons.

Floating covers for gas storage.

Vacuum Filter

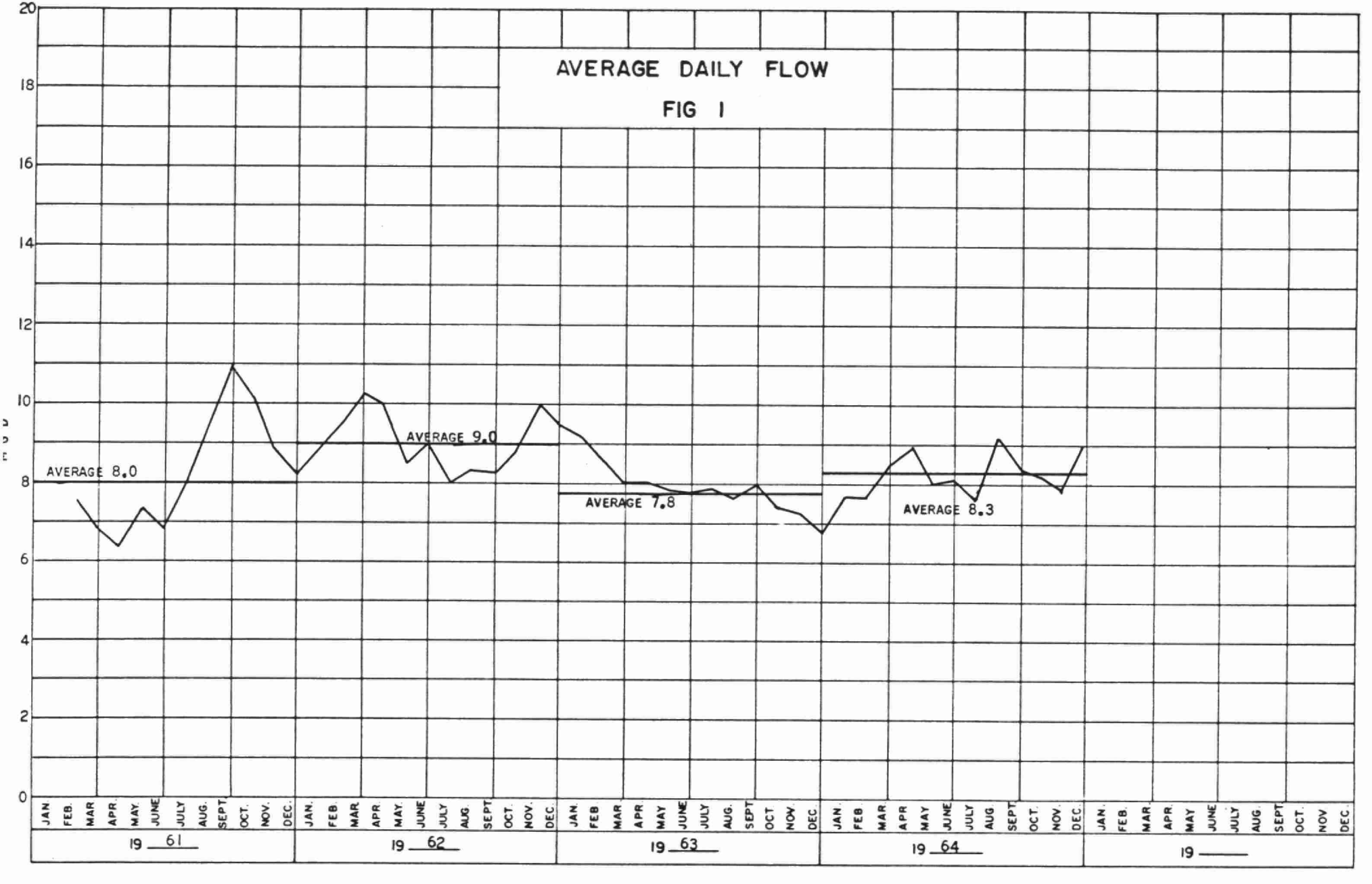
One Komline-Sanderson coil filter with 500 sq. ft. surface area.

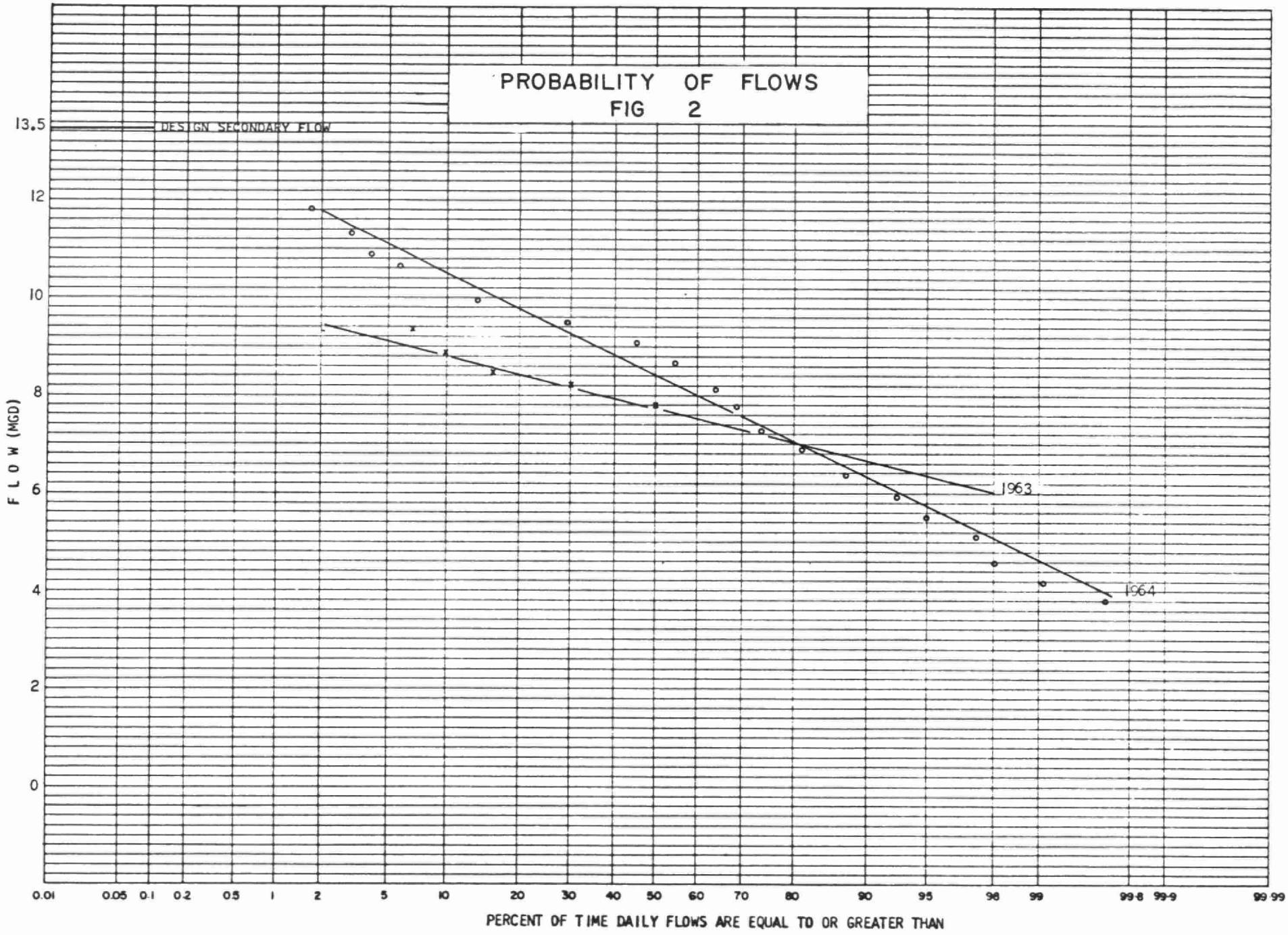
Process Data

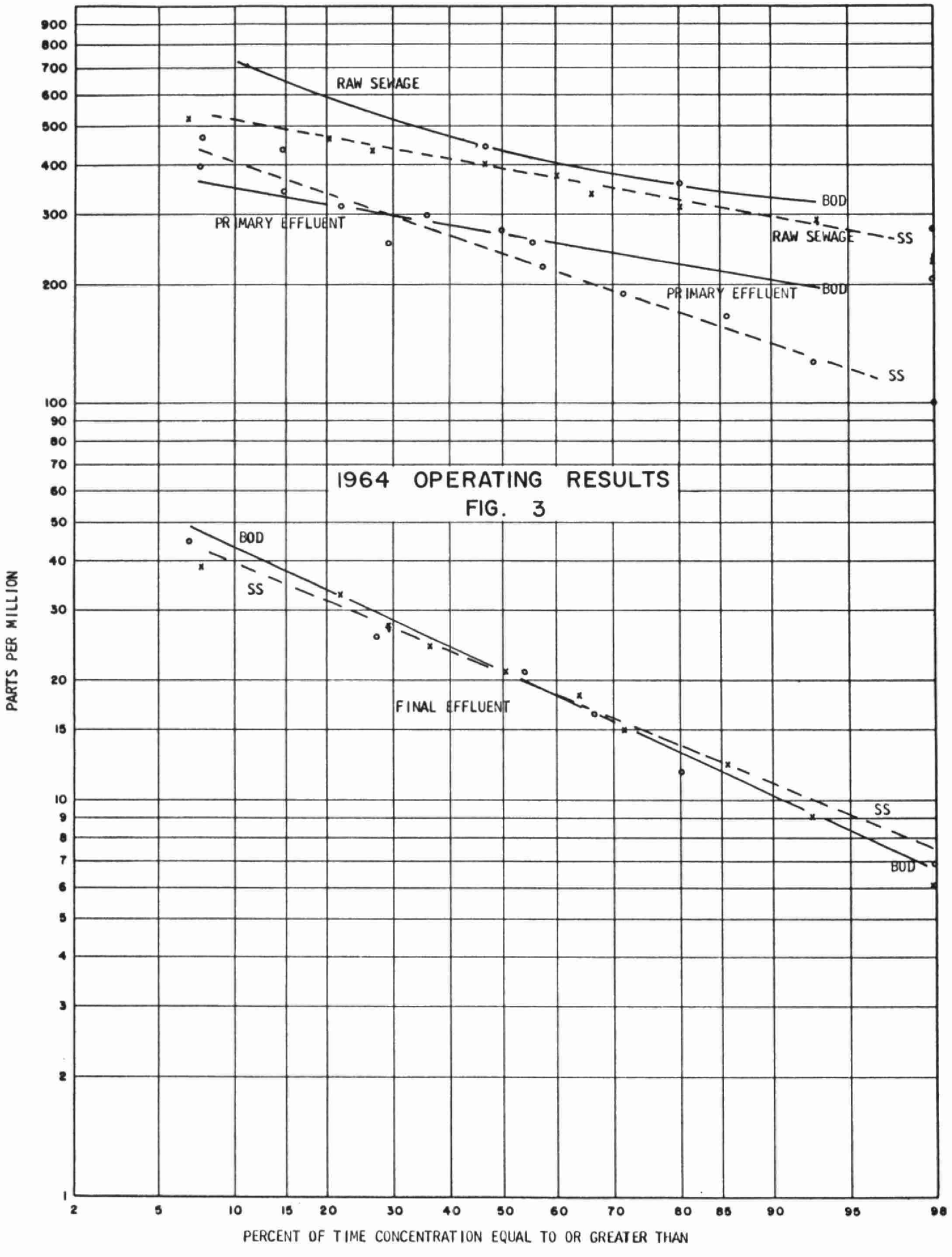
The total daily flows averaged by month for the period, February 1961 to December 1964 are shown on figure No. 1. The average daily flow and the total flow for the year were slightly greater than that for 1963. The average daily flow during 1964 was 8.3 million gallons, an increase of 6.4% over the average of 7.8 million gallons per day received during 1963. During the past year, 3,030 million gallons of raw sewage composed of both domestic and industrial wastes received complete treatment.

The maximum 24 hour flow during 1964 was 12.41 million gallons and occurred in the month of August. The maximum average daily flow for one month occurred in August and was 9.2 million gallons per day. Average daily flows for a month of 9.0 mgd were also recorded in April and December producing the three peaked curve shown in figure No. 1. The minimum average daily flow for a month occurred in July and was 8.0 mgd.

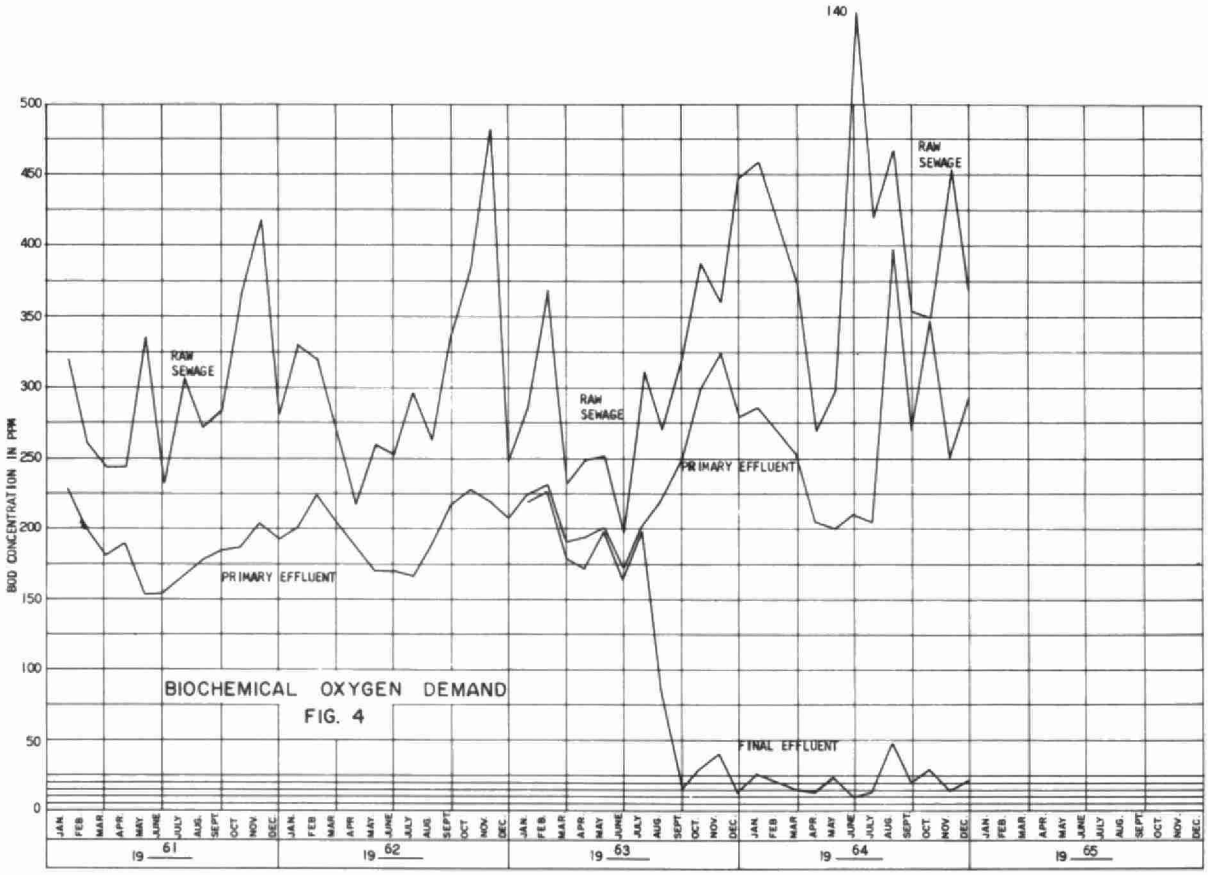
From figure No. 2 it can be seen that the average daily flows for 1964 did not exceed the design flow of 13.5 mgd. It may also be seen from this graph that the flow received at the plant during 1964 was equal to or greater than 10.5 mgd only 6% of the time.


AVERAGE DAILY FLOW
FIG 1
20
18
16
14
12
10
8
6
4
2
0
AVERAGE 8.0
AVERAGE 9.0
AVERAGE 7.8
AVERAGE 8.3
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
19 61
19 62
19 63
19 64
19

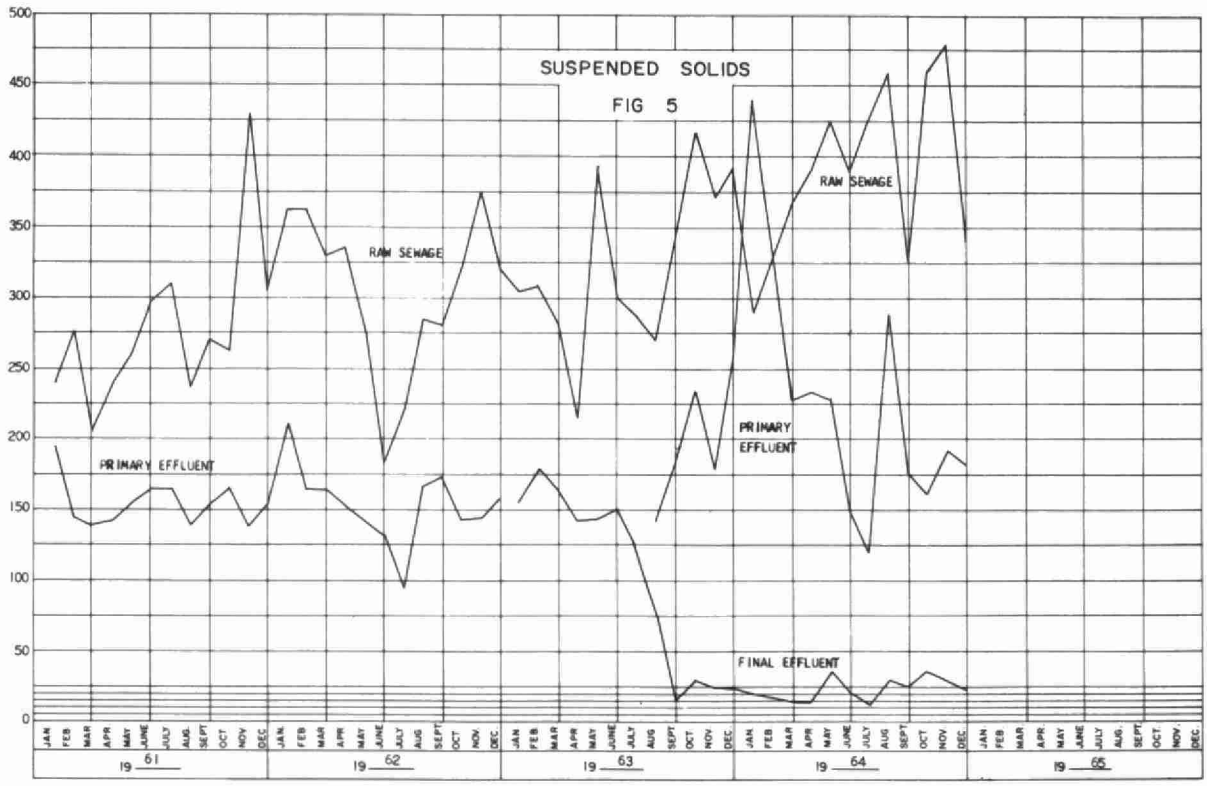

PROBABILITY OF FLOWS
FIG 2
DESIGN SECONDARY FLOW
13.5
12
10
8
6
4
2
0
FLOW (MGD)
1963
1964
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME DAILY FLOWS ARE EQUAL TO OR GREATER THAN



1964 OPERATING RESULTS
FIG. 3



MONTHLY VARIATIONS



MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	460	24	94.5	521	288	17	94	323.8	241
FEB.	*451	20	95.5	482.5	*394	20	95.0	388.7	483
MAR.	375	14.2	96	479.8	369	11	97	476	371
APR.	270	12	95.5	347.5	392	11	97	513.2	542
MAY	300	23	92.5	345.8	426	34	92	489.3	462
JUNE	1140	6.8	99.5	1384.8	388	16	96	454.6	420
JULY	420	12	97.0	483.5	404	9	97.5	469.1	700
AUG.	470	45	90.5	606.4	462	26	94.5	622.1	581
SEPT.	355	18	95.0	425.5	324	22	93.0	381.3	462
OCT.	350	27	92.0	413.4	462	33	93.0	549.0	427
NOV.	455	14	97.0	527.3	482	26	94.5	545.3	476
DEC.	370	19	95.0	463.6	338	20	94.0	420.0	448
TOTAL	-	-	-	6522.2	-	-	-	5659.6	5613
AVG.	451	20	95.5	543.5	394	20	95.0	471.6	468

* AVERAGE VALUE, NO SAMPLE

GRIT, B.O.D AND S.S. REMOVAL

The BOD and suspended solids concentrations and removals are based on eight hour composite samples collected at regular weekly intervals. The BOD and suspended solids concentrations of the raw sewage, primary effluent and final effluent are presented on a probability plot in figure No. 3. The influent, primary effluent and final effluent, BOD and suspended solids averaged for the month are plotted on an arithmetic basis on figures 4 and 5 respectively.

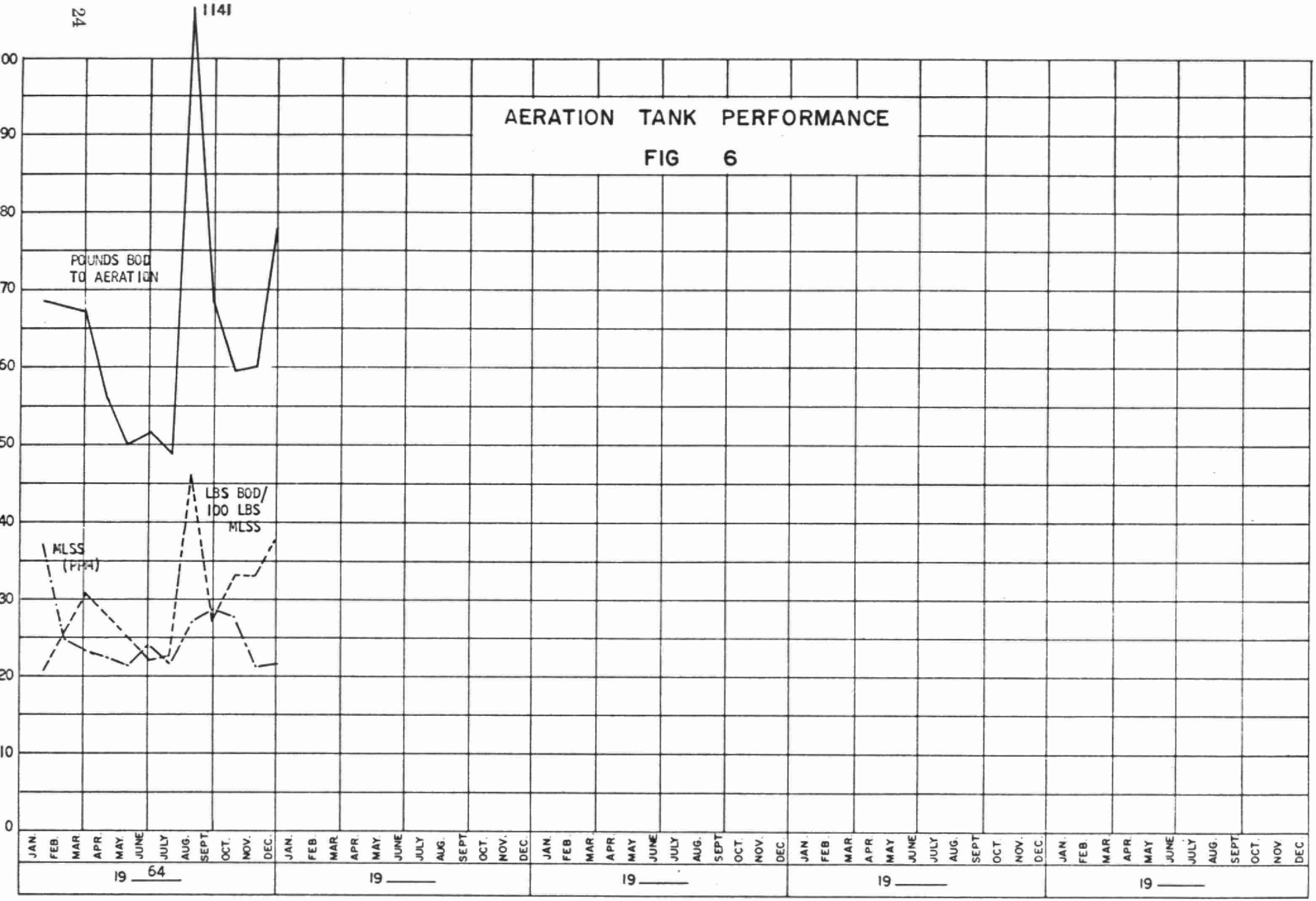
The average BOD concentration of 451 ppm is 1.5 times greater than the design concentration of 300 ppm. Inspection of figures 3 and 4 indicates that the raw sewage BOD concentration exceeded the plant design approximately 95% of the time. A total of 6,522 tons of BOD were removed in 1964 producing an average BOD reduction of 95.5%.

The average final effluent BOD of 20 ppm is slightly greater than the OWRC objective of 15 ppm. The final effluent BOD concentration exceeded this objective 72% of the time.

The average suspended solids concentration of 394 ppm is 87.5% of the design concentration of 450 ppm. It can be seen that the raw sewage suspended solids concentration exceeded the plant design 25% of the time. A total of 5,660 tons of suspended solids were removed in 1964 producing an average suspended solids reduction of 95%.

The average final effluent suspended solids of 20 ppm is slightly greater than the OWRC objective of 15 ppm. The final effluent suspended solids concentration exceeded this objective 75% of the time.

A total of 5,613 cubic feet of grit was removed during the year. This is equivalent to 1.84 cubic feet per million gallons of sewage treated.

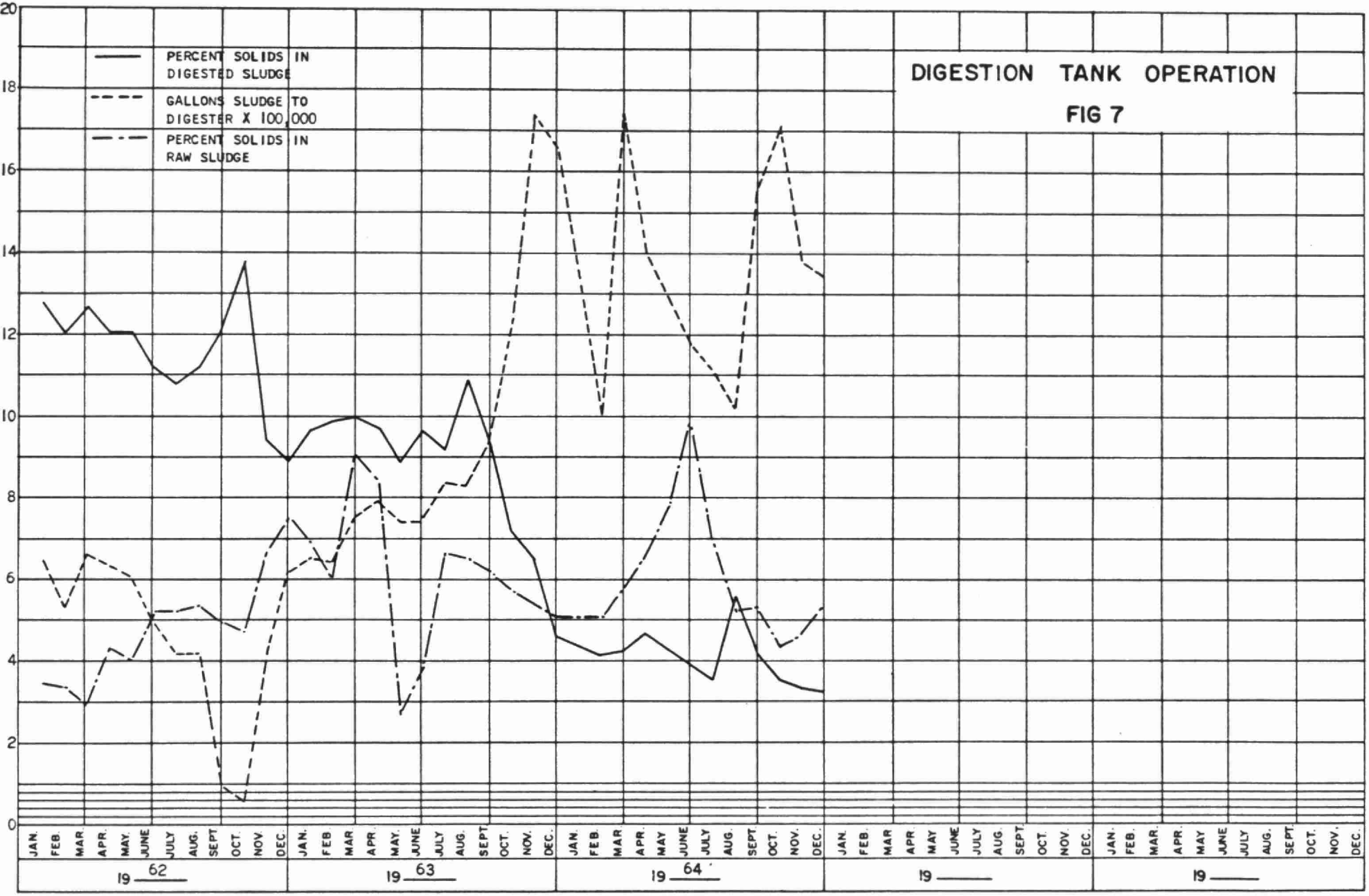

1141
AERATION TANK PERFORMANCE
FIG 6
POUNDS BOD TO AERATION
LBS BOD/ 100 LBS MLSS
MLSS (PPM)
100
90
80
70
60
50
40
30
20
10
0
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT OCT. NOV. DEC.
19 64
19 ____
19 ____
19 ____
19 ____

AERATION SECTION

MONTH	PRIM. EFFL B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	285	3738	20	-
FEBRUARY	-	2484	-	-
MARCH	252	2310	31	-
APRIL	205	2248	28	-
MAY	200	2121	25	-
JUNE	210	2396	22	-
JULY	205	2118	22	-
AUGUST	400	2673	45	-
SEPTEMBER	270	2849	27	-
OCTOBER	350	2762	33	-
NOVEMBER	250	2106	33	-
DECEMBER	295	2164	38	-
TOTAL	-	-	-	-
AVERAGE	266	2497	29	-

COMMENTS

The average MLSS concentration of 2497 ppm and the average pounds of BOD per 100 pounds MLSS ratio of 29 are both well within the accepted limits for good aeration section operation. The pounds of BOD to the aeration section, MLSS concentrations and pounds of BOD per 100 pounds MLSS ratios averaged on a monthly basis for the year plotted in figure No. 6.


PERCENT SOLIDS IN DIGESTED SLUDGE
GALLONS SLUDGE TO DIGESTER X 100,000
PERCENT SOLIDS IN RAW SLUDGE
DIGESTION TANK OPERATION
FIG 7
20
18
16
14
12
10
8
6
4
2
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV DEC.
19 62
19 63
19 64
19 ____
19 ____

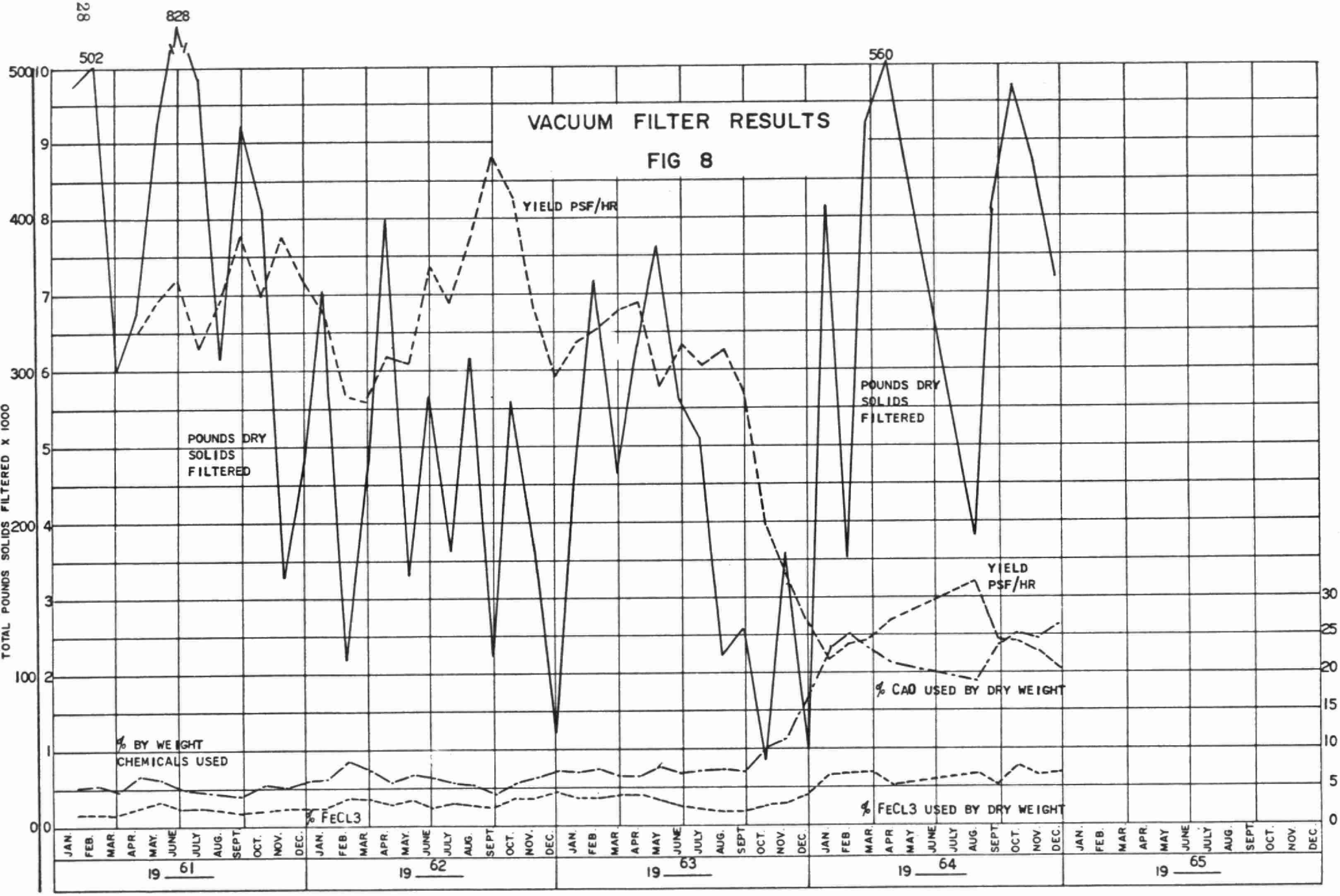
DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU.FT.	% SOLIDS	% VOL. MAT.	1000'S CU.FT.	% SOLIDS	% VOL. MAT	
JAN.	-	-	-	-	-	-	-
FEB.	*163.30	5.10	3.44	196.71	4.12	2.42	-
MAR.	280.30	5.76	3.95	267.16	4.20	2.32	-
APR.	224.38	6.60	4.39	263.35	4.67	3.35	-
MAY	207.96	7.76	4,82	-	-	** -	-
JUNE	187.07	9.97	5.59	-	-	-	-
JULY	179.18	6.96	4.74	143.96	3.53	1.92	-
AUG.	163.41	5.25	3.59	160.80	5.58	2.45	-
SEPT.	250.61	5.26	3.71	262.96	4.10	2.33	-
OCT.	275.53	4.38	3.16	267.82	3.51	2.00	-
NOV.	221.54	4.66	3.52	299.50	3.34	1.92	-
DEC.	214.46	5.38	3.96	210.75	3.21	1.89	-
TOTAL	(a) 2533.89	-	-	(b) 2225.57	-	-	-
AVG.	211.16	6.10	4.08	222.56	4.03	2.29	-

*commenced reporting digester data
** secondaries down (a) total prorated on 11 month's data (b) total prorated on 9 months data.

COMMENTS

From the information obtained, an average of 211,160 cubic feet of sludge per month was pumped to the primary digesters. This sludge contained an average of 6.10 percent total solids of which 67.0 percent was volatile matter. Sludge from the primary digesters contained an average of 4.03 percent total solids of which 56.8 percent was volatile matter. The volatile matter was reduced by an average of 35.2 percent which favourably compares with the established criteria. Raw sludge solids expressed as percent by weight and averaged on a monthly basis are plotted in figure number 7 along with the gallons of sludge per month pumped to the digesters.


VACUUM FILTER RESULTS
FIG 8
502
828
560
YIELD PSF/HR
POUNDS DRY SOLIDS FILTERED
POUNDS DRY SOLIDS FILTERED
YIELD PSF/HR
% CaO USED BY DRY WEIGHT
% BY WEIGHT CHEMICALS USED
% FeCL3
% FeCL3 USED BY DRY WEIGHT
TOTAL POUNDS SOLIDS FILTERED X 1000
500
400
300
200
100
0
10
9
8
7
6
5
4
3
2
1
0
30
25
20
15
10
5
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
19 61
19 62
19 63
19 64
19 65

VACUUM FILTER OPERATION

MONTH	FILTER HOURS		% SOLIDS DIGEST SLUDGE	LBS. DRY SOLIDS FILTERED	LBS. LIME	% LIME	LBS. $FeCl_3$	% $FeCl_3$	% SOLIDS FILTERED SLUDGE	YIELD PSF/HOUR
	#1	#2								
JAN.	367.5	-	** 3.75	408900	91060	22.3	26098	6.38	11.7	2.17
FEB.	151.0	-	3.99	177800	42590	24.0	11907	6.70	17.6	2.36
MAR.	385.0	-	4.02	464800	106790	23.0	31760	6.83	16.9	2.41
APR.	417.0	-	4.68	560200	118120	21.1	28462	5.08	17.6	2.69
MAY.	* -	-	-	-	-	-	-	-	-	-
JUNE	* -	-	-	-	-	-	-	-	-	-
JULY	* -	-	-	-	-	-	-	-	-	-
AUG.	104.5	-	6.16	165200	31200	18.9	6598	3.99	22.5	3.21
SEPT.	338.8	-	4.15	405200	93680	23.1	21137	5.22	19.4	2.40
OCT.	407.5	-	3.59	488500	122260	25.0	36645	7.50	17.9	2.40
NOV.	384.0	-	3.42	436900	106770	24.4	31079	7.11	17.8	2.28
DEC.	353.0	-	3.10	360600	94000	26.1	23483	6.52	18.8	2.04
TOTAL	2908.3	-	-	3468100	806470	-	217169	-	-	-
AVG.	323.1	-	4.10	385344	89608	23.1	24130	6.15	17.8	2.44

* filters not in service
** from secondary digester

COMMENTS

The average filter yield of 2.44 pounds per square foot per hour is below that anticipated with a combination of digested primary and activated sludge. Vacuum filtration increased the average percent solids from 4.10 percent to 17.8 percent. Pounds of dry solids filtered per month and filter yield average on a monthly basis are plotted in figure No. 8.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	239.00	11200	4.69
FEBRUARY	223.91	6880	3.07
MARCH	265.94	7155	2.69
APRIL	269.41	8695	3.23
MAY	249.64	10780	4.32
JUNE	244.40	8260	3.38
JULY	237.01	8025	3.38
AUGUST	285.37	9331	3.27
SEPTEMBER	252.54	10090	4.00
OCTOBER	255.97	9335	3.65
NOVEMBER	239.15	9025	3.77
DECEMBER	264.18	8920	3.38
TOTAL	3026.52	107696	-
AVERAGE	25.221	8975	3.56

COMMENTS

An average chlorine dosage rate of 3.56 ppm was required to maintain a residual of 0.5 ppm after 15 minutes contact time.

CONCLUSIONS

The average BOD and suspended solids removals were 95.6 percent and 95.0 percent respectively which indicates that the plant afforded excellent efficiency in treating the sewage. Throughout the year the plant staff operated a clean, attractive and efficient plant for the City of Kitchener.

RECOMMENDATIONS

Difficulties have been encountered during certain periods in obtaining an adequate supply of water and a potable water of good quality. It is, therefore, recommended that steps be taken to renovate the existing plant water system.

Electric power is supplied by Rural Hydro. In this particular case there is a limit to the amount of electric power that can be supplied to the plant. As a result of this power limitation only three-quarters of the aeration section can be used. At this point, as the flow increases, the necessity for operating the complete aeration section also increases to maintain a high BOD removal efficiency. In view of this fact, it is also recommended that the power supply be transferred from Rural Hydro to the Kitchener PUC during 1965.


ONTARIO WATER RESOURCES COMMISSION